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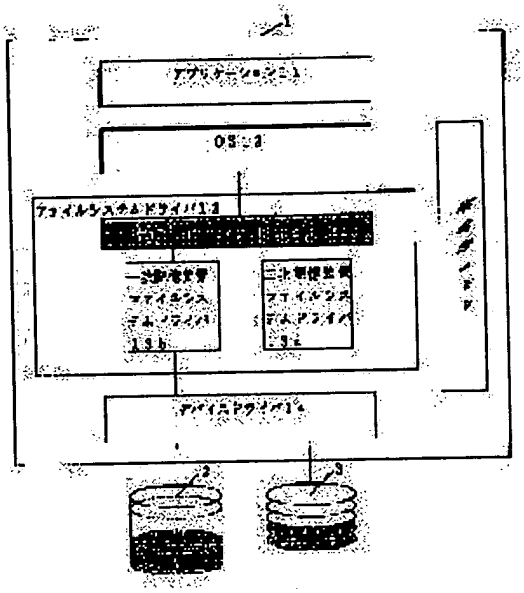
(54) INFORMATION MANAGEMENT SYSTEM FOR PLURAL STORAGE DEVICES

(57)Abstract:
PROBLEM TO BE SOLVED: To enable plural storage devices to be used through one interface and to expand the capacity in a system where the storage capacity is insufficient without changing the interface.
SOLUTION: In an information processing system provided with a controller 1 for information processing and plural storage devices storing information, the plural storage devices are provided with a primary storage device 2 and a secondary storage device 3 which forms the hierarchical structure of the primary storage device and has a large data capacity, the controller performs the information management of the primary and secondary storage devices by using a device driver 14 that respectively operates and controls the primary and secondary storage devices and respective file system drivers 13b and 13c provided every primary and secondary storage device, and the controller manages information by integrating plural file system drivers so as to construct an integrated file system driver 13a formed at their upper position, the driver 13a recognizing the primary and secondary storage devices as one logical storage device.



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* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] In the information processing system equipped with two or more storage which memorizes the control unit and information for information processing said two or more storage The storage of 1 with which information management methods differ, and other storage are included. Said control unit While performing information management of said store using the device driver which carries out motion control of each store, and the file system driver prepared for every difference in said information management method Said control device unifies two or more file system drivers from which said information management method differs, and forms them in the high order. The information management method of two or more stores characterized by building and carrying out information management of the integrated file system driver which can recognize said two or more stores as one logical store.
[Claim 2] It is the information management method of two or more stores which said store of 1 is a primary storage which consists of a magnetic disk in the information management method of two or more stores according to claim 1, and are characterized by a store besides the above being a secondary storage of the data volume size which forms the layered structure of said primary storage.
[Claim 3] It is the information management method of two or more storage characterized by being the storage connected to another control unit to which storage besides the above is connected in a network in the information management method of two or more storage according to claim 1.
[Claim 4] The information management method of two or more storage characterized by carrying out the data shift of the information which connects the old storage information was remembered to be by different information management method in the information management method of two or more storage according to claim 1 as storage besides the above, and is memorized by said old storage at said storage of 1.
[Claim 5] In the information processing system equipped with two or more storage which memorizes the control unit and information for information processing said two or more storage It has a primary storage and the secondary storage of the data volume size which forms the layered structure of said primary storage. Said control unit While performing information management of said primary and secondary storage using the device driver which carries out motion control of said primary and secondary storage, respectively, primary [said], and each file system driver prepared for every secondary storage Said control device unifies two or more file system drivers from which said information management method differs, and forms them in the high order. Information management of the integrated file system driver which can recognize said primary and secondary storage as one logical store is built and carried out. Said secondary storage The information management method of two or more storage characterized by having the control section which analyzes the management information of said primary storage, and which is controlled to transmit both the information on said primary storage to said secondary storage.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to management of the storage of a computer. The capacity of storage is extended without changing an interface to the existing system. Moreover, the storage of two or more classes with the same interface is accessed.
[0002]
[Description of the Prior Art] In the usual system, it consists of primary storages, such as a hard disk which built or connected [external], in control devices, such as a personal computer and a workstation, and a control device. Although the capacity of a primary storage is limited, an increment of the amount of data generated actually is enhanced from system installation. When the memory capacity of a primary storage is used up, generally deletion of unnecessary data etc. is performed, or a primary storage is added and compensated. Or in the system to which the backup unit is connected, the data in few [operating frequency] primary storages are backed up to a backup unit, and backed up data are deleted from the inside of a primary storage.
[0003] When in any case a system administrator supervises the availability of a primary storage and an availability decreases, it works taking out warning to a system use person etc. In deletion of the above mentioned garbage data, it works [that a user deletes garbage data (a system administrator / Or contacting a system administrator. / deletion) etc. and] according to a system administrator's warning.
[0004] Moreover, in duplication of a primary storage, since it is visible as another storage to a user while the manday of generating of great cost or re-evaluation (reexamination of a system design) of a system occurs, when storage is accessed using modification and application of employment of a user, it may be needed to modification of application.
[0005] The manday which requires the magnitude of a system for the maintenance of such storage in a large system with many users is huge.
[0006] Moreover, in order to hold down the cost of a store as shown by JP,9-297699,A or JP,8-161229,A, there is a thing called the hierarchy memory managerial system which combined the large capacity of an optical disk etc., the low price store (secondary storage), the expensive magnetic disk drive, etc. (primary storage). A hierarchy memory managerial system is shown as one storage combining the part or all, and the secondary storage of a primary storage (for example, in MS-DOS or OS of Windows, the field of a primary-storage proper is visible as a C drive, and the primary storage and secondary storage under management of a hierarchy memory managerial system are visible as a D drive).
[0007] An access rate and cost are balanced by saving little [operating frequency] data at the optical disk of low cost, compensating the rate of stores, such as an optical disk, by using a high-speed magnetic disk as a temporary store as a description of such a hierarchy memory managerial system.
[0008] However, in a hierarchy memory managerial system, the field of management information, such as a procedure (when migration start time and a secondary storage consist of two or more storages, to which storage does it move?) which moves data to a secondary storage, etc. is needed from the field

which the data of the storage region and secondary storage which place data temporarily manage, or a primary storage on a primary storage as described above. Or there is no availability in a primary storage, to be few, it is necessary to newly extend a primary storage.
[0009] Moreover, there are some which avoid the bias of the activity ratio of the storage resource currently distributed in a computer network as shown by JP,9-223047,A.
[0010]
[Problem(s) to be Solved by the Invention] Although storage capacity required at the time of a system design (at the time of system installation) is estimated, a difference appears in estimated capacity and an operating capacity in real employment (a perfect estimate is next to impossible).
[0011] According to this invention, amendment of the error of such an estimate and real activity capacity in systems operation is enabled. Moreover, it leads also to system-wide cost reduction by connecting low cost and mass storage to relief and the secondary storage of a system administrator's load "the exact estimate" in a system design.
[0012] Moreover, the response to the system of the high-reliability which doubles the data shift to a new control device and a control device is attained by connecting/cutting simply.
[0013] Moreover, two or more stores are managed to one, and it becomes the improvement in the facility of the user by offering the same interfaces, such as a dissolution of the limit between stores, such as security and a data name, and relief of a load.
[0014]
[Means for Solving the Problem] In order to solve said technical problem, this invention mainly adopts the following configurations.
[0015] In the information processing system equipped with two or more storage which memorizes the control unit and information for information processing said two or more storage The storage of 1 with which information management methods differ, and other storage are included. Said control unit While performing information management of said store using the device driver which carries out motion control of each store, and the file system driver prepared for every difference in said information management method Said control device is the information management method of two or more stores which build and carry out information management of the integrated file system driver which unifies two or more file system drivers from which said information management method differs, forms in the high order, and can recognize said two or more stores as one logical store.
[0016] Moreover, it is the information management method of two or more stores which are secondary storages of the data volume size in which said store of 1 is a primary storage which consists of a magnetic disk in the information management method of said two or more stores, and a store besides the above forms the layered structure of said primary storage.
[0017] In the information processing system equipped with two or more storage which memorizes the control unit and information for information processing moreover, said two or more storage It has a primary storage and the secondary storage of the data volume size which forms the layered structure of said primary storage. Said control unit While performing information management of said primary and secondary storage using the device driver which carries out motion control of said primary and secondary storage, respectively, primary [said], and each file system driver prepared for every secondary storage Said control device unifies two or more file system drivers from which said information management method differs, and forms them in the high order. Information management of the integrated file system driver which can recognize said primary and secondary storage as one logical store is built and carried out. Said secondary storage The information management method of two or more storage which has the control section which analyzes the management information of said primary storage, and which is controlled to transmit both the information on said primary storage to said secondary storage.
[0018]
[Embodiment of the Invention] The management method of the storage concerning the operation gestalt of this invention is explained below using a drawing. Drawing 1 is the schematic diagram of the hierarchy memory managerial system used in the operation gestalt of this invention. This managerial

system consists of secondary storages 3 which memorize the data with which it overflowed in the control device 1 called the personal computer and workstation and the control device from the primary storages 2, such as a hard disk drive unit which builds or connects [external], and a primary storage. Moreover, the backup unit 4 which backs up the data of a primary storage 2 if needed is connected.
[0019] The system configuration of data control before and after applying the operation gestalt of this invention is shown in drawing 2 . It consists of a control device 1, a primary storage 2, and a backup unit (not shown) of the data of a primary storage 2 at the beginning [of a system construction] ((1) of drawing 2). A system is employed, the amount of data increases with time amount progress, and the amount of the primary storage 2 used becomes large ((2) of drawing 2).
[0020] Secondary storages 3 (optical disk with large data volume etc.) are connected in this condition, the data of a primary storage are moved to a secondary storage, and the storage region of a primary storage 2 is vacated ((3) of drawing 2). Drawing 3 explains connection of a secondary storage.
[0021] On the other hand, in the conventional hierarchy memory management, primary-storage 3a and the secondary storage 3 which place data temporarily become a pair, and it is visible as one logical drive as shown in (4) of drawing 2 (hierarchy memory administrative logical drive 30).
[0022] That is, other temporary-memory 3a is prepared independently [a temporary memory 2], it uses as a temporary (replacing with need ******, and primary-storage 3a besides the above, and using the proper field in a temporary memory 2) storage region, a secondary storage 3 is connected to this temporary-memory 3a, said store 3a and store 3 are unified, and it grasps as one logical drive 30.
[0023] For this reason, when a fixed free area is required for a primary storage (as a temporary storage region of the data for transmitting data to a secondary storage 3) and there is no free area, it is necessary to prepare a primary storage independently (as other new temporary-memory 3a).
[0024] The data of a primary storage 2 are moved to the logical drive of hierarchy memory management by a system administrator etc. after hierarchy memory managerial system construction (see the arrow head of manual migration of drawing 2 of (4)). Data migration to a secondary storage 3 from primary-storage 3a is automatically performed at the set-up time of day.
[0025] Drawing 3 illustrates the description of the operation gestalt of this invention, and shows the software structure and circumference hardware which operate with a control unit 1. OS12 and the store 2 with which the graphic display structure of drawing 3 manages resources, such as a task of the applications 11, such as database management software, and application, and volatile memory, the file system driver 13 which manages the data in three, and the device driver 14 which manages a physical device -- since -- it is constituted.
[0026] Integrated file system driver 13a is one of the file system drivers, it rewrites the pointer to the existing primary-storage file system driver 13b memorized by the volatile memory in a control unit 1, seizes the demand to primary-storage file system driver 13b from OS12, gives a demand to primary-storage file system driver 13b if needed, and performs the demand from OS12.
[0027] For example, when the retrieval demand read/write demand of a file is received from OS12, and data analyze whether it is in a primary storage, and whether it is in a secondary storage and are in a primary storage, a primary storage is accessed through primary-storage file system driver 13b, and when it is in a secondary storage, a secondary storage is accessed through the direct device driver 14. In addition, the positional information whether data are in a primary storage or to be in a secondary storage is mainly managed by volatile memory, and when not going into volatile memory, it is memorized to a primary storage.
[0028] When it puts in another way, it is the descriptions of this operation gestalt to prepare integrated file system driver 13a which unifies primary-storage file system driver 13b and secondary-storage file system driver 13c here, to connect this driver 13a and OS12, and to consider as one interface, and that a primary storage 2 and a secondary storage 3 can be dealt with as one logical drive.
[0029] To a device driver 14 being what performs lead of each storage, and control of a light, generally a file system driver is said, manages the directory structure of storage etc., and since the data control methods of storage differ in the case of drawing 3 , it needs to form the file system drivers 13b and 13c for every storage. Integrated file system driver 13a builds the directory in the drive as one logical drive,

for example, a C drive, and a primary storage 2 and a secondary storage 3 tend to carry out package integration, and it tends to carry out data control for a store 2 and a store 3.
[0030] Thus, in this operation gestalt, the integrated file system driver which seizes the demand to a file system and manages two or more stores between the file system drivers and OS's which manage the data in a store is offered, and the data memorized by the integrated file system driver at each store are managed. The storage management system of this invention is explained below in comparison with the conventional technique. Drawing 4 is the software configuration of the conventional hierarchy memory managerial system. Below the file system driver that is a point of difference with drawing 3 is shown.
[0031] Hierarchy management software 13d is nucleus software which controls a hierarchical management system. The data stored in primary-storage 3a and a secondary storage 3 (refer to (4) of drawing 2) are managed. Access to primary-storage 3a used temporarily is performed through primary-storage file system driver 13b, and access to a secondary storage is performed through secondary-storage file system driver 13c shown also by drawing 3 .
[0032] Drawing 3 is compared with drawing 4 . The biggest difference is an interface with OS (and application).
[0033] In MS-DOS and Windows, a mount point is in charge of logical drives (specifically C drive, D drive, etc.), and in charge of this interface in UNIX. With the configuration of drawing 3 , there is an interface with OS for every file system driver but at drawing 4 . An interface can be set to one like drawing 4 by putting in integrated file system driver 13a between OS12 and primary-storage file system driver 13b from the condition of drawing 3 .
[0034] Drawing 5 is the detail drawing of a secondary storage 3. It consists of a microcomputer 33 which controls the drive 32, the storage 31, and drive 32 which write the storages 31, such as the storages 31, such as an optical disk, and an optical disk drive. Usually, according to the demand from a control device 1, a microcomputer 33 moves a storage 31 to drive 22, and controls the writing of the data of a storage 31, and read-out of data.
[0035] When installing first integrated file system driver 13a shown in drawing 3 , or there is no free area in a primary storage 2, when very few, an integrated file system driver cannot be written in a primary storage. It becomes impossible in this case, to perform an integrated file system driver on a control unit with a natural thing. In order to avoid such a condition, by reading a part of primary storage 2 using a microcomputer 33, and saving to a storage 31, it is vacant in a primary storage 2, and area is made.
[0036] A microcomputer 33 reads the management information of a primary storage 2, searchs the old data of an updating date, or the old data of an access date, reads the data, and writes it in a storage 31. Then, the management information of a primary storage 2 is rewritten and it considers as the condition of having deleted the data written in a storage 31.
[0037] By the above, an integrated file system driver is written in the field as for which the primary storage 2 was vacant (installing), and an integrated file system driver is performed on a control device (it loads to the memory of a personal computer and this driver is made to work).
[0038] An integrated file system driver checks the existence of management information, such as positional information of data, at the time of the first starting. If there is nothing to a primary storage, if there is nothing also to a secondary storage, to a secondary storage, management information will newly be built. Construction of positional information searches all the data on a primary storage, analyzes the layered structure of a data name or a directory, and when there is no capacity of arbitration in a primary storage or a primary storage by using an analysis result as a database, it writes it in a secondary storage.
[0039] And the existence of the data which communicated with the microcomputer 33 through the device driver, and were evacuated from the primary storage 2 is checked at the time of positional information construction. the data which evacuated in a certain case -- "secondary storage -- it is -- " -- ****** -- it registers with a database.
[0040] Management information, such as positional information, is usually memorized to volatile memory and a primary storage. However, since the field vacated by drawing 5 backs up management information to a secondary storage only by the capacity of an integrated file system driver in

consideration of the case where it is not memorizable to a primary storage, and failure of a primary storage, it memorizes also to a secondary storage.
[0041] Drawing 6 is drawing which extended drawing 3 and managed two or more stores unitary by one integrated file system driver 13a by integrated file system driver 13a.
[0042] The network equipment 5 which is the storage connected to another control unit connected in the RAID storage 21 which took the reliable RAID configuration, or a network is added. By the classification approach beforehand specified by the system administrator, integrated file system driver 13a distributes and memorizes data to each store. For example, it is important and the data which must not be lost are memorized to the store by which the data which need little [access frequency] mothball were connected to the RAID store 21 through network equipment 5 to the secondary storage 3 at another control unit when data were sent also to a remote place, in order to double data.
[0043] Moreover, a limit is absorbed by the integrated file system driver among stores, such as naming conventions (die length, assignment failure as a data name, etc.) of a data name, and existence of security.
[0044] For example, the large storage of limit that only the thing which has as short the die length of a data name as about 10 bytes and which cannot insert a tooth space is attached to a data name, When the small store of a limit with which a limit of an alphabetic character kind can also set up die length to hundreds of bytes few is intermingled, the difference between stores can be absorbed by managing positional information and the data name also with few limits of an alphabetic character kind long as an alias name together by the integrated file system driver.
[0045] Moreover, when the store which can set up the right of a lead, a light right, the right of activation, etc. for every user, and the store which can set up only one security that a light (updating) is improper, for every data are intermingled, advanced security can be set also to a store only with the security of a low by managing security for every data by the integrated file system driver.
[0046] The new structure of a system at the time of shifting data to a new system from the old system at drawing 7 is shown. The new storage 24 introduced with the old storage 23 which is using close [of data] by the old system which is, and is in close [of data], and a new control unit is connected. These two stores 23 and 24 can be accessed as one drive by the integrated file system driver. And data shift can be performed by not copying data to a new store from the old store, and connecting the old store and a new store to a new control unit as a procedure which shifts data to the new system which consists of a new control unit and a new store from the old system which consists of the old control unit and the old store.
[0047] The system with which the storage of a distributed environment connected to drawing 8 in the network and the storage which it was local and was connected are unified and searched is shown. Storage 2 is the local storage by which direct continuation was carried out to the control unit 1. A control unit 100 is a remote controller connected with the control unit 1 in the network. Storage 200 is the storage of RIMOTO connected to the control unit 100.
[0048] The data light to a store 200 is performed from the high-speed control unit 100 of data transfer. On the other hand, in order to search collectively the data currently distributed on a network, and the data of the local store 2, both are unified and searched with a control device 1 by the integrated file system driver.
[0049] In order to refer to integrated file system driver 13a of a control device 1, in a control device 100, data are written in a store 200 and index information, such as a data name of the data written in a control device 1, is sent the back. In a control device 1, the received index information is managed as management information together with positional information.
[0050] An integrated file system driver will search data from management information, if a retrieval demand is received from application etc. Since a search is performed by a control unit 1 or storage 2 without a network, it is carried out to a high speed. As a result of a search, when the thing appropriate for retrieval conditions is in storage 200, a lead demand is performed to control information 100. Moreover, when the thing appropriate for retrieval conditions is in storage 2, it leads from storage 2.
[0051]

[Effect of the Invention] As explained above, according to this invention, two or more recording apparatus can be used with one interfaces (a logical drive or mount point), and capacity can be extended, without capacity being insufficient and changing an interface into a system.
[0052] Moreover, maintainability, such as backup and setting out of doubleness, becomes high by unifying and managing two or more stores.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to management of the storage of a computer. The capacity of storage is extended without changing an interface to the existing system. Moreover, the storage of two or more classes with the same interface is accessed.
[0002]
[Description of the Prior Art] In the usual system, it consists of primary storages, such as a hard disk which built or connected [external], in control devices, such as a personal computer and a workstation, and a control device. Although the capacity of a primary storage is limited, an increment of the amount of data generated actually is enhanced from system installation. When the memory capacity of a primary storage is used up, generally deletion of unnecessary data etc. is performed, or a primary storage is added and compensated. Or in the system to which the backup unit is connected, the data in few [operating frequency] primary storages are backed up to a backup unit, and backed up data are deleted from the inside of a primary storage.
[0003] When in any case a system administrator supervises the availability of a primary storage and an availability decreases, it works taking out warning to a system use person etc. In deletion of the above mentioned garbage data, it works [that a user deletes garbage data (a system administrator / Or contacting a system administrator. / deletion) etc. and] according to a system administrator's warning.
[0004] Moreover, in duplication of a primary storage, since it is visible as another storage to a user while the manday of generating of great cost or re-evaluation (reexamination of a system design) of a system occurs, when storage is accessed using modification and application of employment of a user, it may be needed to modification of application.
[0005] The manday which requires the magnitude of a system for the maintenance of such storage in a large system with many users is huge.
[0006] Moreover, in order to hold down the cost of a store as shown by JP,9-297699,A or JP,8-161229,A, there is a thing called the hierarchy memory managerial system which combined the large capacity of an optical disk etc., the low price store (secondary storage), the expensive magnetic disk drive, etc. (primary storage). A hierarchy memory managerial system is shown as one storage combining the part or all, and the secondary storage of a primary storage (for example, in MS-DOS or OS of Windows, the field of a primary-storage proper is visible as a C drive, and the primary storage and secondary storage under management of a hierarchy memory managerial system are visible as a D drive).
[0007] An access rate and cost are balanced by saving little [operating frequency] data at the optical disk of low cost, compensating the rate of stores, such as an optical disk, by using a high-speed magnetic disk as a temporary store as a description of such a hierarchy memory managerial system.
[0008] However, in a hierarchy memory managerial system, the field of management information, such as a procedure (when migration start time and a secondary storage consist of two or more storages, to which storage does it move?) which moves data to a secondary storage, etc. is needed from the field

which the data of the storage region and secondary storage which place data temporarily manage, or a primary storage on a primary storage as described above. Or there is no availability in a primary storage, to be few, it is necessary to newly extend a primary storage.
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[0010]
[Problem(s) to be Solved by the Invention] Although storage capacity required at the time of a system design (at the time of system installation) is estimated, a difference appears in estimated capacity and an operating capacity in real employment (a perfect estimate is next to impossible).
[0011] According to this invention, amendment of the error of such an estimate and real activity capacity in systems operation is enabled. Moreover, it leads also to system-wide cost reduction by connecting low cost and mass storage to relief and the secondary storage of a system administrator's load "the exact estimate" in a system design.
[0012] Moreover, the response to the system of the high-reliability which doubles the data shift to a new control device and a control device is attained by connecting/cutting simply.
[0013] Moreover, two or more stores are managed to one, and it becomes the improvement in the facility of the user by offering the same interfaces, such as a dissolution of the limit between stores, such as security and a data name, and relief of a load.
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[Means for Solving the Problem] In order to solve said technical problem, this invention mainly adopts the following configurations.
[0015] In the information processing system equipped with two or more storage which memorizes the control unit and information for information processing said two or more storage The storage of 1 with which information management methods differ, and other storage are included. Said control unit While performing information management of said store using the device driver which carries out motion control of each store, and the file system driver prepared for every difference in said information management method Said control device is the information management method of two or more stores which build and carry out information management of the integrated file system driver which unifies two or more file system drivers from which said information management method differs, forms in the high order, and can recognize said two or more stores as one logical store.
[0016] Moreover, it is the information management method of two or more stores which are secondary storages of the data volume size in which said store of 1 is a primary storage which consists of a magnetic disk in the information management method of said two or more stores, and a store besides the above forms the layered structure of said primary storage.
[0017] In the information processing system equipped with two or more storage which memorizes the control unit and information for information processing moreover, said two or more storage It has a primary storage and the secondary storage of the data volume size which forms the layered structure of said primary storage. Said control unit While performing information management of said primary and secondary storage using the device driver which carries out motion control of said primary and secondary storage, respectively, primary [said], and each file system driver prepared for every secondary storage Said control device unifies two or more file system drivers from which said information management method differs, and forms them in the high order. Information management of the integrated file system driver which can recognize said primary and secondary storage as one logical store is built and carried out. Said secondary storage The information management method of two or more storage which has the control section which analyzes the management information of said primary storage, and which is controlled to transmit both the information on said primary storage to said secondary storage.
[0018]
[Embodiment of the Invention] The management method of the storage concerning the operation gestalt of this invention is explained below using a drawing. Drawing 1 is the schematic diagram of the hierarchy memory managerial system used in the operation gestalt of this invention. This managerial

system consists of secondary storages 3 which memorize the data with which it overflowed in the control device 1 called the personal computer and workstation and the control device from the primary storages 2, such as a hard disk drive unit which builds or connects [external], and a primary storage. Moreover, the backup unit 4 which backs up the data of a primary storage 2 if needed is connected.
[0019] The system configuration of data control before and after applying the operation gestalt of this invention is shown in drawing 2 . It consists of a control device 1, a primary storage 2, and a backup unit (not shown) of the data of a primary storage 2 at the beginning [of a system construction] ((1) of drawing 2). A system is employed, the amount of data increases with time amount progress, and the amount of the primary storage 2 used becomes large ((2) of drawing 2).
[0020] Secondary storages 3 (optical disk with large data volume etc.) are connected in this condition, the data of a primary storage are moved to a secondary storage, and the storage region of a primary storage 2 is vacated ((3) of drawing 2). Drawing 3 explains connection of a secondary storage.
[0021] On the other hand, in the conventional hierarchy memory management, primary-storage 3a and the secondary storage 3 which place data temporarily become a pair, and it is visible as one logical drive as shown in (4) of drawing 2 (hierarchy memory administrative logical drive 30).
[0022] That is, other temporary-memory 3a is prepared independently [a temporary memory 2], it uses as a temporary (replacing with need ******, and primary-storage 3a besides the above, and using the proper field in a temporary memory 2) storage region, a secondary storage 3 is connected to this temporary-memory 3a, said store 3a and store 3 are unified, and it grasps as one logical drive 30.
[0023] For this reason, when a fixed free area is required for a primary storage (as a temporary storage region of the data for transmitting data to a secondary storage 3) and there is no free area, it is necessary to prepare a primary storage independently (as other new temporary-memory 3a).
[0024] The data of a primary storage 2 are moved to the logical drive of hierarchy memory management by a system administrator etc. after hierarchy memory managerial system construction (see the arrow head of manual migration of drawing 2 of (4)). Data migration to a secondary storage 3 from primary-storage 3a is automatically performed at the set-up time of day.
[0025] Drawing 3 illustrates the description of the operation gestalt of this invention, and shows the software structure and circumference hardware which operate with a control unit 1. OS12 and the store 2 with which the graphic display structure of drawing 3 manages resources, such as a task of the applications 11, such as database management software, and application, and volatile memory, the file system driver 13 which manages the data in three, and the device driver 14 which manages a physical device -- since -- it is constituted.
[0026] Integrated file system driver 13a is one of the file system drivers, it rewrites the pointer to the existing primary-storage file system driver 13b memorized by the volatile memory in a control unit 1, seizes the demand to primary-storage file system driver 13b from OS12, gives a demand to primary-storage file system driver 13b if needed, and performs the demand from OS12.
[0027] For example, when the retrieval demand read/write demand of a file is received from OS12, and data analyze whether it is in a primary storage, and whether it is in a secondary storage and are in a primary storage, a primary storage is accessed through primary-storage file system driver 13b, and when it is in a secondary storage, a secondary storage is accessed through the direct device driver 14. In addition, the positional information whether data are in a primary storage or to be in a secondary storage is mainly managed by volatile memory, and when not going into volatile memory, it is memorized to a primary storage.
[0028] When it puts in another way, it is the descriptions of this operation gestalt to prepare integrated file system driver 13a which unifies primary-storage file system driver 13b and secondary-storage file system driver 13c here, to connect this driver 13a and OS12, and to consider as one interface, and that a primary storage 2 and a secondary storage 3 can be dealt with as one logical drive.
[0029] To a device driver 14 being what performs lead of each storage, and control of a light, generally a file system driver is said, manages the directory structure of storage etc., and since the data control methods of storage differ in the case of drawing 3 , it needs to form the file system drivers 13b and 13c for every storage. Integrated file system driver 13a builds the directory in the drive as one logical drive,

for example, a C drive, and a primary storage 2 and a secondary storage 3 tend to carry out package integration, and it tends to carry out data control for a store 2 and a store 3.
[0030] Thus, in this operation gestalt, the integrated file system driver which seizes the demand to a file system and manages two or more stores between the file system drivers and OS's which manage the data in a store is offered, and the data memorized by the integrated file system driver at each store are managed. The storage management system of this invention is explained below in comparison with the conventional technique. Drawing 4 is the software configuration of the conventional hierarchy memory managerial system. Below the file system driver that is a point of difference with drawing 3 is shown.
[0031] Hierarchy management software 13d is nucleus software which controls a hierarchical management system. The data stored in primary-storage 3a and a secondary storage 3 (refer to (4) of drawing 2) are managed. Access to primary-storage 3a used temporarily is performed through primary-storage file system driver 13b, and access to a secondary storage is performed through secondary-storage file system driver 13c shown also by drawing 3 .
[0032] Drawing 3 is compared with drawing 4 . The biggest difference is an interface with OS (and application).
[0033] In MS-DOS and Windows, a mount point is in charge of logical drives (specifically C drive, D drive, etc.), and in charge of this interface in UNIX. With the configuration of drawing 3 , there is an interface with OS for every file system driver but at drawing 4 . An interface can be set to one like drawing 4 by putting in integrated file system driver 13a between OS12 and primary-storage file system driver 13b from the condition of drawing 3 .
[0034] Drawing 5 is the detail drawing of a secondary storage 3. It consists of a microcomputer 33 which controls the drive 32, the storage 31, and drive 32 which write the storages 31, such as the storages 31, such as an optical disk, and an optical disk drive. Usually, according to the demand from a control device 1, a microcomputer 33 moves a storage 31 to drive 22, and controls the writing of the data of a storage 31, and read-out of data.
[0035] When installing first integrated file system driver 13a shown in drawing 3 , or there is no free area in a primary storage 2, when very few, an integrated file system driver cannot be written in a primary storage. It becomes impossible in this case, to perform an integrated file system driver on a control unit with a natural thing. In order to avoid such a condition, by reading a part of primary storage 2 using a microcomputer 33, and saving to a storage 31, it is vacant in a primary storage 2, and area is made.
[0036] A microcomputer 33 reads the management information of a primary storage 2, searchs the old data of an updating date, or the old data of an access date, reads the data, and writes it in a storage 31. Then, the management information of a primary storage 2 is rewritten and it considers as the condition of having deleted the data written in a storage 31.
[0037] By the above, an integrated file system driver is written in the field as for which the primary storage 2 was vacant (installing), and an integrated file system driver is performed on a control device (it loads to the memory of a personal computer and this driver is made to work).
[0038] An integrated file system driver checks the existence of management information, such as positional information of data, at the time of the first starting. If there is nothing to a primary storage, if there is nothing also to a secondary storage, to a secondary storage, management information will newly be built. Construction of positional information searches all the data on a primary storage, analyzes the layered structure of a data name or a directory, and when there is no capacity of arbitration in a primary storage or a primary storage by using an analysis result as a database, it writes it in a secondary storage.
[0039] And the existence of the data which communicated with the microcomputer 33 through the device driver, and were evacuated from the primary storage 2 is checked at the time of positional information construction. the data which evacuated in a certain case -- "secondary storage -- it is -- " -- ****** -- it registers with a database.
[0040] Management information, such as positional information, is usually memorized to volatile memory and a primary storage. However, since the field vacated by drawing 5 backs up management information to a secondary storage only by the capacity of an integrated file system driver in

consideration of the case where it is not memorizable to a primary storage, and failure of a primary storage, it memorizes also to a secondary storage.
[0041] Drawing 6 is drawing which extended drawing 3 and managed two or more stores unitary by one integrated file system driver 13a by integrated file system driver 13a.
[0042] The network equipment 5 which is the storage connected to another control unit connected in the RAID storage 21 which took the reliable RAID configuration, or a network is added. By the classification approach beforehand specified by the system administrator, integrated file system driver 13a distributes and memorizes data to each store. For example, it is important and the data which must not be lost are memorized to the store by which the data which need little [access frequency] mothball were connected to the RAID store 21 through network equipment 5 to the secondary storage 3 at another control unit when data were sent also to a remote place, in order to double data.
[0043] Moreover, a limit is absorbed by the integrated file system driver among stores, such as naming conventions (die length, assignment failure as a data name, etc.) of a data name, and existence of security.
[0044] For example, the large storage of limit that only the thing which has as short the die length of a data name as about 10 bytes and which cannot insert a tooth space is attached to a data name, When the small store of a limit with which a limit of an alphabetic character kind can also set up die length to hundreds of bytes few is intermingled, the difference between stores can be absorbed by managing positional information and the data name also with few limits of an alphabetic character kind long as an alias name together by the integrated file system driver.
[0045] Moreover, when the store which can set up the right of a lead, a light right, the right of activation, etc. for every user, and the store which can set up only one security that a light (updating) is improper, for every data are intermingled, advanced security can be set also to a store only with the security of a low by managing security for every data by the integrated file system driver.
[0046] The new structure of a system at the time of shifting data to a new system from the old system at drawing 7 is shown. The new storage 24 introduced with the old storage 23 which is using close [of data] by the old system which is, and is in close [of data], and a new control unit is connected. These two stores 23 and 24 can be accessed as one drive by the integrated file system driver. And data shift can be performed by not copying data to a new store from the old store, and connecting the old store and a new store to a new control unit as a procedure which shifts data to the new system which consists of a new control unit and a new store from the old system which consists of the old control unit and the old store.
[0047] The system with which the storage of a distributed environment connected to drawing 8 in the network and the storage which it was local and was connected are unified and searched is shown. Storage 2 is the local storage by which direct continuation was carried out to the control unit 1. A control unit 100 is a remote controller connected with the control unit 1 in the network. Storage 200 is the storage of RIMOTO connected to the control unit 100.
[0048] The data light to a store 200 is performed from the high-speed control unit 100 of data transfer. On the other hand, in order to search collectively the data currently distributed on a network, and the data of the local store 2, both are unified and searched with a control device 1 by the integrated file system driver.
[0049] In order to refer to integrated file system driver 13a of a control device 1, in a control device 100, data are written in a store 200 and index information, such as a data name of the data written in a control device 1, is sent the back. In a control device 1, the received index information is managed as management information together with positional information.
[0050] An integrated file system driver will search data from management information, if a retrieval demand is received from application etc. Since a search is performed by a control unit 1 or storage 2 without a network, it is carried out to a high speed. As a result of a search, when the thing appropriate for retrieval conditions is in storage 200, a lead demand is performed to control information 100. Moreover, when the thing appropriate for retrieval conditions is in storage 2, it leads from storage 2.
[0051]

[Effect of the Invention] As explained above, according to this invention, two or more recording apparatus can be used with one interfaces (a logical drive or mount point), and capacity can be extended, without capacity being insufficient and changing an interface into a system.
[0052] Moreover, maintainability, such as backup and setting out of doubleness, becomes high by unifying and managing two or more stores.

[Translation done.]

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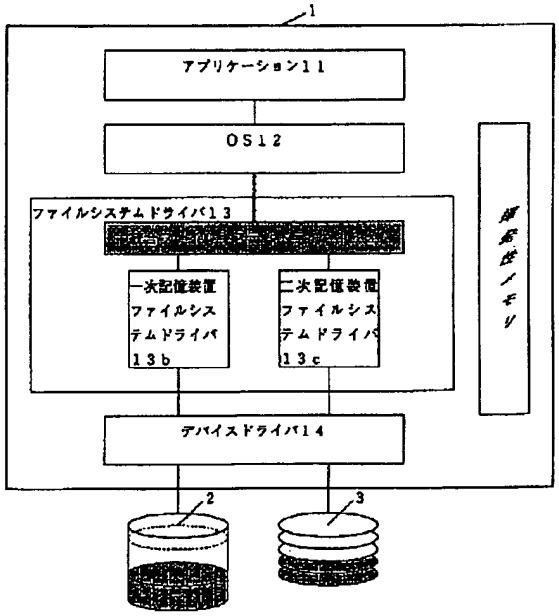
最終頁に続く

(54)【発明の名称】　複数記憶装置の情報管理方式

(57)【要約】
【課題】　複数の記録装置を１つのインタフェースによって使用可能とし、記憶容量不足のシステムにインタフェースを変えずに容量を増設すること。
【解決手段】　情報処理のための制御装置１と情報を記憶する複数の記憶装置とを備えた情報処理システムにおいて、複数の記憶装置は、一次記憶装置２と、一次記憶装置の階層構造を形成するデータ容量大の二次記憶装置３と、を備え、制御装置は、一次と二次記憶装置をそれぞれ動作制御するデバイスドライバ１４と一次と二次記憶装置毎に設けられたそれぞれのファイルシステムドライバ１３ｂ，１３ｃとを用いて、一次と二次記憶装置の情報管理を行うとともに、制御装置は、複数のファイルシステムドライバを統合してその上位に形成し、一次と二次記憶装置を論理的な１つの記憶装置として認識できる統合ファイルシステムドライバ１３ａを構築して情報管理すること。

図３



【特許請求の範囲】
【請求項１】　情報処理のための制御装置と情報を記憶する複数の記憶装置とを備えた情報処理システムにおいて、
前記複数の記憶装置は、情報管理方式の異なる一の記憶装置と他の記憶装置を含み、
前記制御装置は、各記憶装置を動作制御するデバイスドライバと前記情報管理方式の差異毎に設けられたファイルシステムドライバとを用いて、前記記憶装置の情報管理を行うとともに、
前記制御装置は、前記情報管理方式の異なる複数のファイルシステムドライバを統合してその上位に形成し、前記複数の記憶装置を論理的な１つの記憶装置として認識できる統合ファイルシステムドライバを構築して情報管理することを特徴とする複数記憶装置の情報管理方式。
【請求項２】　請求項１に記載の複数記憶装置の情報管理方式において、
前記一の記憶装置は磁気ディスクからなる一次記憶装置であり、
前記他の記憶装置は前記一次記憶装置の階層構造を形成するデータ容量大の二次記憶装置であることを特徴とする複数記憶装置の情報管理方式。
【請求項３】　請求項１に記載の複数記憶装置の情報管理方式において、
前記他の記憶装置はネットワークで接続される別の制御装置に接続された記憶装置であることを特徴とする複数記憶装置の情報管理方式。
【請求項４】　請求項１に記載の複数記憶装置の情報管理方式において、
異なる情報管理方式で情報の記憶された旧記憶装置を前記他の記憶装置として接続し、
前記旧記憶装置に記憶されている情報を前記一の記憶装置にデータ移行することを特徴とする複数記憶装置の情報管理方式。
【請求項５】　情報処理のための制御装置と情報を記憶する複数の記憶装置とを備えた情報処理システムにおいて、
前記複数の記憶装置は、一次記憶装置と、前記一次記憶装置の階層構造を形成するデータ容量大の二次記憶装置と、を備え、
前記制御装置は、前記一次と二次記憶装置をそれぞれ動作制御するデバイスドライバと前記一次と二次記憶装置毎に設けられたそれぞれのファイルシステムドライバとを用いて、前記一次と二次記憶装置の情報管理を行うとともに、
前記制御装置は、前記情報管理方式の異なる複数のファイルシステムドライバを統合してその上位に形成し、前記一次と二次記憶装置を論理的な１つの記憶装置として認識できる統合ファイルシステムドライバを構築して情報管理し、
前記二次記憶装置は、前記一次記憶装置の管理情報を解析するとともに前記一次記憶装置の情報を前記二次記憶装置に転送するように制御する制御部を有することを特徴とする複数記憶装置の情報管理方式。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明はコンピュータの記憶装置の管理に関するものである。既存のシステムに対してインタフェースを変えずに記憶装置の容量を拡張するものである。また、同一のインタフェースで複数の種類の記憶装置にアクセスするものである。
【０００２】
【従来の技術】通常のシステムでは、パーソナルコンピュータやワークステーション等の制御装置と制御装置内に内蔵または外部接続したハードディスク等の一次記憶装置からなる。一次記憶装置の容量は有限であるにも関わらず、実際に発生するデータ量はシステム導入から増加の一途をたどる。一次記憶装置の記憶容量を使い果たした場合、一般的には不要なデータの削除等を行うか一次記憶装置を追加して補う。または、バックアップ装置が接続されているシステムでは使用頻度の少ない一次記憶装置内のデータをバックアップ装置にバックアップし、バックアップしたデータを一次記憶装置内から削除する。
【０００３】いずれの場合もシステム管理者が一次記憶装置の空き容量を監視し、空き容量が少なくなった時点でシステムの使用者に対して警告を出す等の作業を行う。前記した不要データの削除では、システム管理者の警告に応じて、使用者が不要データの削除（またはシステム管理者へ連絡しシステム管理者が削除）をする等の作業を行う。
【０００４】また、一次記憶装置の増設では、多大なコストの発生やシステムの再検討（システム設計の見直し）の工数が発生するとともに、使用者に対して別の記憶装置として見えるので、使用者の運用の変更やアプリケーションを使って記憶装置にアクセスしている場合はアプリケーションの改造まで必要になる可能性がある。
【０００５】システムの規模が大きく使用者の数が多いシステムでは、このような記憶装置のメンテナンスにかかる工数は膨大なものである。
【０００６】また、特開平９－２９７６９９号公報や特開平８－１６１２２９号公報で示されるような、記憶装置のコストを抑える為に光ディスク等の大容量，低価格な記憶装置（二次記憶装置）と高価な磁気ディスク装置等（一次記憶装置）を組合せた階層記憶管理システムというものがある。階層記憶管理システムは、一次記憶装置の一部または全部と二次記憶装置を組み合わせて１つの記憶装置として見せるものである（例えば、ＭＳ－ＤＯＳやＷｉｎｄｏｗｓといったＯＳでは、一次記憶装置固有の領域はＣドライブとして、階層記憶管理システム

の管理下の一次記憶装置と二次記憶装置はDドライブとして見える)。

【0007】このような階層記憶管理システムの特徴としては、高速な磁気ディスクを一時的な記憶装置として使う事により光ディスク等の記憶装置の速度を補いつつ、使用頻度の少ないデータを低コストの光ディスクに保存する事によりアクセス速度とコストのバランスを取るものである。

【0008】しかし、階層記憶管理システムでは、前記した通り一時的にデータを置く記憶領域や二次記憶装置のデータの管理する領域や一次記憶装置から二次記憶装置にデータを移動する手順(移動開始時刻や二次記憶装置が複数の記憶媒体からなる時にどの記憶媒体に移動するか)等の管理情報の領域等が、一次記憶装置上に必要になる。一次記憶装置に空き容量が無いまたは少ない場合は新たに一次記憶装置を増設する必要がある。

【0009】また、特開平9-223047号公報で示されるようなコンピュータネットワーク内に分散している記憶資源の使用率の偏りを回避するものがある。

【0010】

【発明が解決しようとする課題】システム設計時(システム導入時)に必要な記憶容量を見積るものだが、見積り容量と実運用での使用容量には差がでる(完全な見積りは不可能に近い)。

【0011】本発明によれば、このような見積りと実使用容量の誤差をシステム運用中に補正可能とするものである。また、システム設計での「正確な見積り」というシステム管理者の負荷の軽減や二次記憶装置に低コスト、大容量の記憶装置を接続する事により、システム全体のコスト低減にもつながる。

【0012】また、簡単に接続/切断する事により、新しい制御装置へのデータ移行や制御装置を二重化する高信頼性のシステムへの対応が可能になる。

【0013】また、複数の記憶装置を1つに管理し、セキュリティやデータ名等の記憶装置間の制限の解消等、同一インタフェースを提供する事による使用者の使いやすさの向上および負荷の軽減になる。

【0014】

【課題を解決するための手段】前記課題を解決するために、本発明は主として次のような構成を採用する。

【0015】情報処理のための制御装置と情報を記憶する複数の記憶装置とを備えた情報処理システムにおいて、前記複数の記憶装置は、情報管理方式の異なる一の記憶装置と他の記憶装置を含み、前記制御装置は、各記憶装置を動作制御するデバイスドライバと前記情報管理方式の差異毎に設けられたファイルシステムドライバとを用いて、前記記憶装置の情報管理を行うとともに、前記制御装置は、前記情報管理方式の異なる複数のファイルシステムドライバを統合してその上位に形成し、前記複数の記憶装置を論理的な1つの記憶装置として認識できる統合ファイルシステムドライバを構築して情報管理する複数記憶装置の情報管理方式。

【0016】また、前記複数記憶装置の情報管理方式において、前記一の記憶装置は磁気ディスクからなる一次記憶装置であり、前記他の記憶装置は前記一次記憶装置の階層構造を形成するデータ容量大の二次記憶装置である複数記憶装置の情報管理方式。

【0017】また、情報処理のための制御装置と情報を記憶する複数の記憶装置とを備えた情報処理システムにおいて、前記複数の記憶装置は、一次記憶装置と、前記一次記憶装置の階層構造を形成するデータ容量大の二次記憶装置と、を備え、前記制御装置は、前記一次と二次記憶装置をそれぞれ動作制御するデバイスドライバと前記一次と二次記憶装置毎に設けられたそれぞれのファイルシステムドライバとを用いて、前記一次と二次記憶装置の情報管理を行うとともに、前記制御装置は、前記情報管理方式の異なる複数のファイルシステムドライバを統合してその上位に形成し、前記一次と二次記憶装置を論理的な1つの記憶装置として認識できる統合ファイルシステムドライバを構築して情報管理し、前記二次記憶装置は、前記一次記憶装置の管理情報を解析するとともに前記一次記憶装置の情報を前記二次記憶装置に転送するように制御する制御部を有する複数記憶装置の情報管理方式。

【0018】

【発明の実施の形態】本発明の実施形態に係る記憶装置の管理方式を図面を用いて以下説明する。図1は本発明の実施形態において利用する階層記憶管理システムの概略図である。この管理システムは、パーソナルコンピュータやワークステーションと言った制御装置1、制御装置内に内蔵または外部接続するハードディスク装置等の一次記憶装置2、一次記憶装置からあふれたデータを記憶する二次記憶装置3から構成される。また、必要に応じて一次記憶装置2のデータをバックアップするバックアップ装置4が接続される。

【0019】本発明の実施形態を適用する前後のデータ管理のシステム構成を図2に示す。システム構築の当初は、制御装置1と一次記憶装置2と一次記憶装置2のデータのバックアップ装置(図示せず)とから構成される(図2の(1))。システムを運用し時間経過とともにデータ量が多くなって、一次記憶装置2の使用量が大きくなる(図2の(2))。

【0020】この状態で二次記憶装置3(データ容量の大きい、例えば光ディスク等)を接続し、一次記憶装置のデータを二次記憶装置に移動し一次記憶装置2の記憶領域を空ける(図2の(3))。二次記憶装置の接続については、図3で説明する。

【0021】一方、従来の階層記憶管理では、図2の(4)に示すとおり、一時的にデータを置く一次記憶装置3aと二次記憶装置3が対になって1つの論理的なド

ライブとして見える（階層記憶管理用論理ドライブ３０）。

【００２２】即ち、一時記憶装置２とは別に他の一時記憶装置３ａを設けて（必要あれば、前記他の一次記憶装置３ａに代えて、一時記憶装置２内の適宜の領域を用いて）一時的な記憶領域として用い、この一時記憶装置３ａに二次記憶装置３を接続し、前記記憶装置３ａと記憶装置３を統合して一つの論理的ドライブ３０として把握する。

【００２３】このために、一次記憶装置に一定の空き領域が必要であり（二次記憶装置３にデータを転送するためのデータの一時的な記憶領域として）、空き領域のない場合は一次記憶装置を別に用意する必要がある（新たな他の一時記憶装置３ａとして）。

【００２４】階層記憶管理システム構築後、システム管理者等によって、一次記憶装置２のデータを階層記憶管理の論理ドライブに移動する（図２の（４）の手動移動の矢印を参照）。一次記憶装置３ａから二次記憶装置３へのデータ移動は、設定された時刻等に自動的に行われる。

【００２５】図３は、本発明の実施形態の特徴を図示するものであり、制御装置１で動作するソフトウェア構造および周辺ハードウェアを示すものである。図３の図示構造は、データベース管理ソフト等のアプリケーション１１、アプリケーションのタスクや揮発性メモリ等の資源を管理するＯＳ１２、記憶装置２，３内のデータを管理するファイルシステムドライバ１３、物理的なデバイスを管理するデバイスドライバ１４、から構成される。

【００２６】統合ファイルシステムドライバ１３ａは、ファイルシステムドライバの１つであり、制御装置１内の揮発性メモリに記憶されている既存の一次記憶装置ファイルシステムドライバ１３ｂへのポインタを書き換えて、ＯＳ１２から一次記憶装置ファイルシステムドライバ１３ｂへの要求を横取りし、必要に応じて一次記憶装置ファイルシステムドライバ１３ｂへ要求を出してＯＳ１２からの要求を実行する。

【００２７】例えば、ＯＳ１２からファイルの検索要求リード／ライト要求を受け付けると、データが一次記憶装置にあるのか二次記憶装置にあるのかを解析し一次記憶装置にある場合は、一次記憶装置ファイルシステムドライバ１３ｂを通して一次記憶装置にアクセスし、二次記憶装置にある場合は、直接デバイスドライバ１４を通して二次記憶装置にアクセスする。尚、データが一次記憶装置にあるか二次記憶装置にあるかという位置情報は、主に揮発性メモリで管理し、揮発性メモリに入らない場合は一次記憶装置に記憶する。

【００２８】ここで、一次記憶装置ファイルシステムドライバ１３ｂと二次記憶装置ファイルシステムドライバ１３ｃを統合する統合ファイルシステムドライバ１３ａを設けて、このドライバ１３ａとＯＳ１２を接続して１つのインタフェースとすること、換言すると、一次記憶装置２も二次記憶装置３も１つの論理的ドライブとして取り扱えることが本実施形態の特徴である。

【００２９】デバイスドライバ１４が各記憶装置のリード、ライトの制御を行うものであるのに対して、ファイルシステムドライバは、一般的に云って、記憶装置のディレクトリ構造等を管理するものであり、図３の場合には記憶装置のデータ管理方式が異なることから記憶装置毎にファイルシステムドライバ１３ｂと１３ｃとを設ける必要がある。統合ファイルシステムドライバ１３ａは、一次記憶装置２も二次記憶装置３も１つの論理的ドライブ、例えば、Ｃドライブとしてそのドライブでのディレクトリを構築して記憶装置２と記憶装置３とを一括統合してデータ管理しようとするものである。

【００３０】このように、本実施形態においては、記憶装置内のデータを管理するファイルシステムドライバとＯＳとの間にファイルシステムへの要求を横取りし複数の記憶装置を管理する統合ファイルシステムドライバを提供し、統合ファイルシステムドライバによって各記憶装置に記憶されているデータを管理するものである。本発明の記憶管理システムについて、従来技術との対比において以下説明する。図４は、従来の階層記憶管理システムのソフトウェア構成である。図３との相違点であるファイルシステムドライバ以下を示している。

【００３１】階層管理ソフトウェア１３ｄは、階層管理システムを制御する中核ソフトウェアである。一次記憶装置３ａおよび二次記憶装置３（図２の（４）参照）に格納されているデータを管理する。一時的に使用する一次記憶装置３ａへのアクセスは、一次記憶装置ファイルシステムドライバ１３ｂを介して行い、二次記憶装置へのアクセスは、図３でも示した二次記憶装置ファイルシステムドライバ１３ｃを介して行う。

【００３２】図３と図４を比較する。最も大きな違いは、ＯＳ（およびアプリケーション）とのインタフェースである。

【００３３】ＭＳ－ＤＯＳ、Ｗｉｎｄｏｗｓでは論理ドライブ（具体的にはＣドライブ、Ｄドライブ等）、ＵＮＩＸではマウントポイントがこのインタフェースにあたる。図３の構成では、ＯＳとのインタフェースが１つだが、図４ではファイルシステムドライバ毎にある。図３の状態からＯＳ１２と一次記憶装置ファイルシステムドライバ１３ｂとの間に統合ファイルシステムドライバ１３ａを入れる事により図４のようにインタフェースを１つにすることが出来る。

【００３４】図５は、二次記憶装置３の詳細図である。光ディスク等の記憶媒体３１、光ディスクドライブ等の記憶媒体３１を読み書きするドライブ３２、記憶媒体３１およびドライブ３２を制御するマイコン３３からなる。通常、マイコン３３は、制御装置１からの要求に応じて、記憶媒体３１をドライブ２２へ移動して記憶媒体

３１のデータの書き込みやデータの読み出しを制御する。

【００３５】図３に示す統合ファイルシステムドライバ１３ａをまず最初にインストールする場合に、一次記憶装置２に空き領域が全くないまたは非常に少ない場合、統合ファイルシステムドライバを一次記憶装置に書き込む事が出来ない。この場合、当然の事ながら統合ファイルシステムドライバを制御装置上で実行することが出来なくなる。このような状態を回避する為に、マイコン３３を使用して一次記憶装置２の一部を読み出し記憶媒体３１へ保存する事により、一次記憶装置２に空きエリアを作る。

【００３６】マイコン３３は、一次記憶装置２の管理情報を読み出し、更新日付の古いデータまたはアクセス日付の古いデータをサーチし、そのデータを読み出し記憶媒体３１に書き込む。その後、一次記憶装置２の管理情報を書き換えて、記憶媒体３１に書き込んだデータを削除した状態とする。

【００３７】上記によって、一次記憶装置２の空いた領域に、統合ファイルシステムドライバを書き込み（インストールし）、制御装置上で統合ファイルシステムドライバを実行する（パソコンのメモリにロードしてこのドライバを稼働させることとなる）。

【００３８】統合ファイルシステムドライバは、最初の起動時にデータの位置情報等の管理情報の有無をチェックする。一次記憶装置になければ二次記憶装置に、二次記憶装置にもなければ新たに管理情報を構築する。位置情報の構築は、一次記憶装置上の全データを検索しデータ名やディレクトリの階層構造を解析し、解析結果をデータベースとして一次記憶装置または一次記憶装置に任意の容量がない場合は二次記憶装置に書き込む。

【００３９】そして、位置情報構築時、デバイスドライバを介してマイコン３３と通信し一次記憶装置２から退避されたデータの有無をチェックする。ある場合は、退避したデータは「二次記憶装置にあり」としてデータベースに登録する。

【００４０】位置情報等の管理情報は、通常、揮発性メモリおよび一次記憶装置に記憶する。ただし、図５で空けた領域が統合ファイルシステムドライバの容量のみで管理情報を一次記憶装置に記憶する事が出来ない場合や、一次記憶装置の故障を考慮して二次記憶装置にバックアップするので二次記憶装置にも記憶する。

【００４１】図６は、図３を拡張して統合ファイルシステムドライバ１３ａにより、複数の記憶装置を１つの統合ファイルシステムドライバ１３ａで一元的に管理した図である。

【００４２】信頼性の高いＲＡＩＤ構成を取ったＲＡＩＤ記憶装置２１やネットワークで接続される別の制御装置に接続された記憶装置であるネットワーク装置５が追加されている。あらかじめシステム管理者によって指定された分類方法によって、統合ファイルシステムドライバ１３ａが各記憶装置にデータを振り分けて記憶する。例えば、重要で紛失してはならないデータはＲＡＩＤ記憶装置２１へ、アクセス頻度の少ない長期保存が必要なデータは二次記憶装置３へ、データを二重化するために遠隔地にもデータを送る場合はネットワーク装置５を介して別の制御装置に接続された記憶装置に記憶する。

【００４３】また、データ名の命名規則（長さやデータ名として指定不可等）やセキュリティの有無等の記憶装置間に制限を統合ファイルシステムドライバで吸収する。

【００４４】例えば、データ名にスペースを入れられない、データ名の長さが１０バイト程度と短いものしか付けられない、といった制限の大きい記憶装置と、文字種の制限が少なく長さも数百バイトまで設定出来る制限の小さい記憶装置が混在している場合に、統合ファイルシステムドライバで位置情報と一緒に別名として長く文字種の制限も少ないデータ名を管理することにより、記憶装置間の差を吸収することが出来る。

【００４５】また、使用者毎にリード権、ライト権、実行権等を設定出来る記憶装置と、データ毎にライト（更新）不可という１つのセキュリティしか設定出来ない記憶装置が混在している場合に、統合ファイルシステムドライバでデータ毎にセキュリティを管理することにより、低レベルのセキュリティしか持たない記憶装置にも高度なセキュリティを設定することが出来る。

【００４６】図７に旧システムから新システムへデータを移行する際の新システムの構成を示す。データの入っている旧システムで使用しておりデータの入っている旧記憶装置２３と新制御装置とともに導入された新記憶装置２４が接続される。これらの２つの記憶装置２３，２４は、統合ファイルシステムドライバにより、１つのドライブとしてアクセス出来る。そして、旧制御装置と旧記憶装置からなる旧システムから新制御装置と新記憶装置からなる新システムへデータを移行する手順として、旧記憶装置から新記憶装置にデータをコピーするのではなくて、新制御装置に旧記憶装置と新記憶装置を接続することにより、データ移行を行うことができる。

【００４７】図８にネットワークで接続された分散環境の記憶装置とローカルで接続した記憶装置を統合して検索するシステムを示す。記憶装置２は、制御装置１に直接接続されたローカルの記憶装置である。制御装置１００は、制御装置１とネットワークで接続されたリモート制御装置である。記憶装置２００は、制御装置１００に接続されたリモートの記憶装置である。

【００４８】記憶装置２００へのデータライトは、データ転送の高速な制御装置１００から行われる。一方、制御装置１ではネットワーク上に分散しているデータおよびローカルの記憶装置２のデータをまとめて検索するために、統合ファイルシステムドライバによって両者を統

合して検索する。

【００４９】制御装置１の統合ファイルシステムドライバ１３ａで検索するために、制御装置１００では記憶装置２００にデータを書き込み後、制御装置１に書き込んだデータのデータ名等のインデックス情報を送る。制御装置１では、受信したインデックス情報を位置情報と一緒に管理情報として管理する。

【００５０】統合ファイルシステムドライバは、アプリケーション等から検索要求を受け付けると管理情報からデータをサーチする。サーチはネットワークを介さず制御装置１または記憶装置２で行われるので高速に行われる。サーチの結果、検索条件にあったものが記憶装置２００にある場合は制御情報１００に対してリード要求を行う。また、検索条件にあったものが記憶装置２にある場合は、記憶装置２からリードする。

【００５１】

【発明の効果】以上説明したように、本発明によれば、複数の記録装置を１つのインタフェース（論理ドライブまたはマウントポイント等）によって使用することができ、容量が不足していてシステムにインタフェースを変えずに容量が増設出来る。

【００５２】また、複数の記憶装置を統合して管理することにより、バックアップや二重化の設定等の保守性が高くなる。

【図面の簡単な説明】

【図１】本発明の実施形態に係る記憶装置管理方式の概要を説明するための図である。

【図２】本実施形態を利用する前後のシステム構成の遷移を示す構成図である。

【図３】本発明の実施形態を詳細に説明した制御装置内および制御装置周辺の構成図である。

【図４】本実施形態を利用しない階層記憶管理システムの構成図である。

【図５】本実施形態を利用した記憶装置内の構成図である

【図６】本実施形態を利用して複数の記憶装置を管理する構成図である。

【図７】本実施形態を利用して新旧の記憶装置を統合して管理する構成図である。

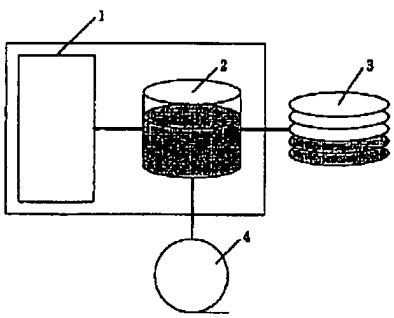
【図８】本実施形態を利用してローカルおよびネットワーク上の記憶装置を統合して管理する構成図である。

【符合の説明】

１　制御装置
２　一次記憶装置
３　二次記憶装置
３ａ　階層記憶管理システムの一時的にデータを記憶する一次記憶装置
４　バックアップ装置
５　ネットワーク装置
１１　アプリケーション
１２　ＯＳ
１３　ファイルシステムドライバ
１３ａ　統合ファイルシステムドライバ
１３ｂ　一次記憶装置ファイルシステムドライバ
１３ｃ　二次記憶装置ファイルシステムドライバ
１３ｄ　階層管理ソフトウェア
１３ｅ　バックアップ装置ファイルシステムドライバ
１４　デバイスドライバ
２１　ＲＡＩＤ構成の一次記憶装置
２２　ＲＡＩＤ構成をとらない一次記憶装置
２３　旧システムの記憶装置
２４　新システムの記憶装置
３０　階層記憶管理用論理ドライブ
３１　二次記憶装置内の記憶媒体
３２　二次記憶装置内のドライブ
３３　二次記憶装置内のマイコン
１００　ネットワーク上の制御装置
２００　ネットワーク上の記憶装置

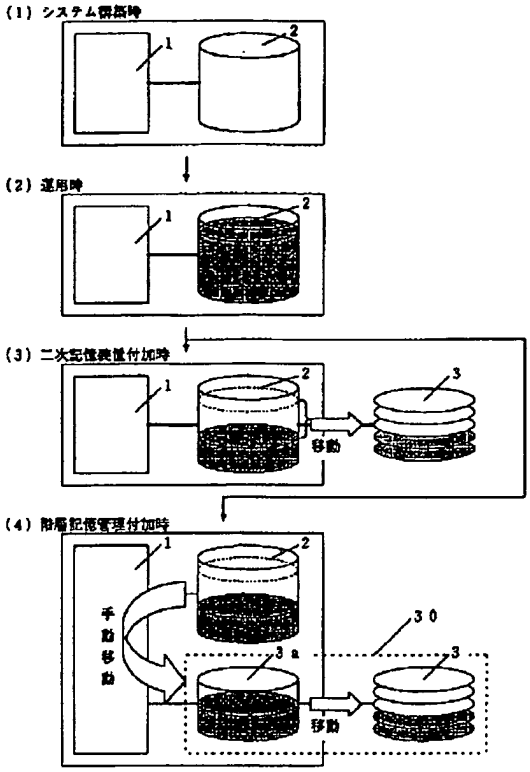
【図１】

図1



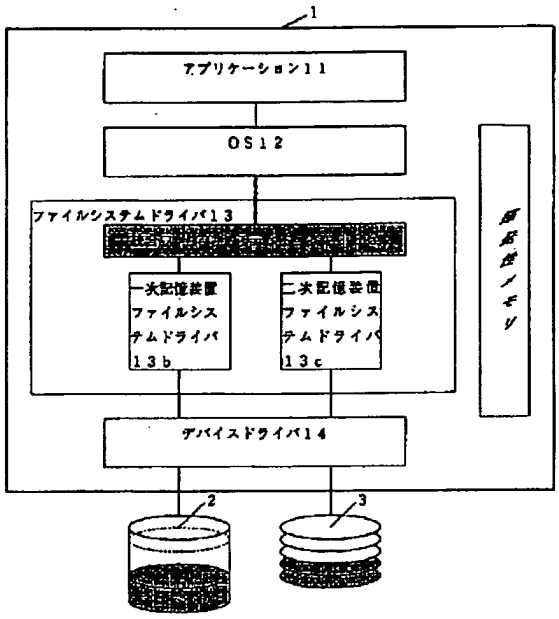
【図2】

図2



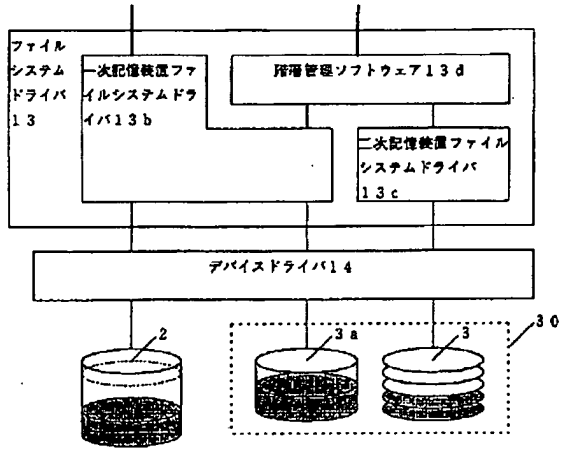
【図3】

図3



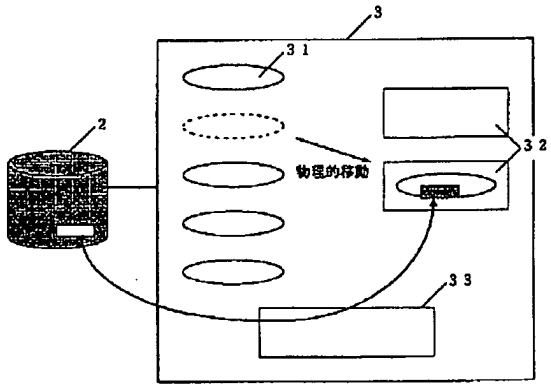
【図4】

図4



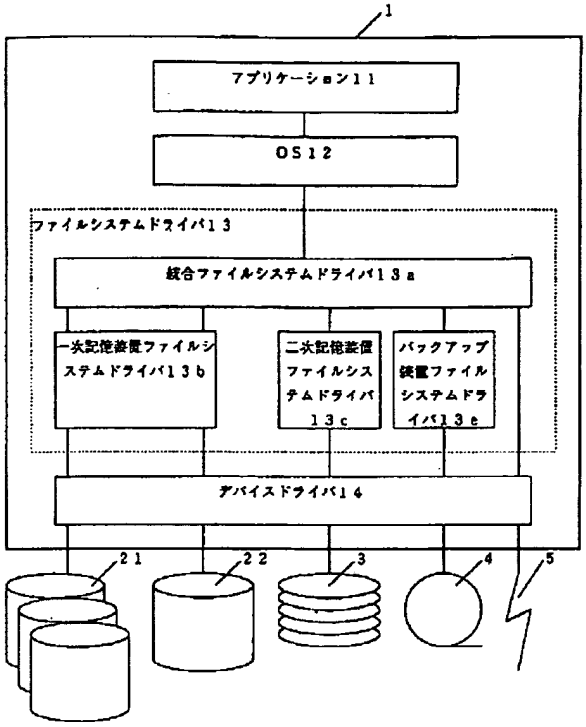
【図5】

図5



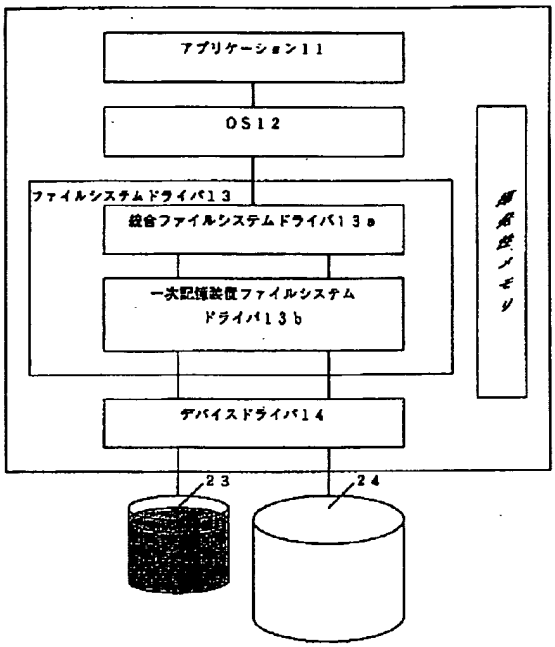
【図6】

図6



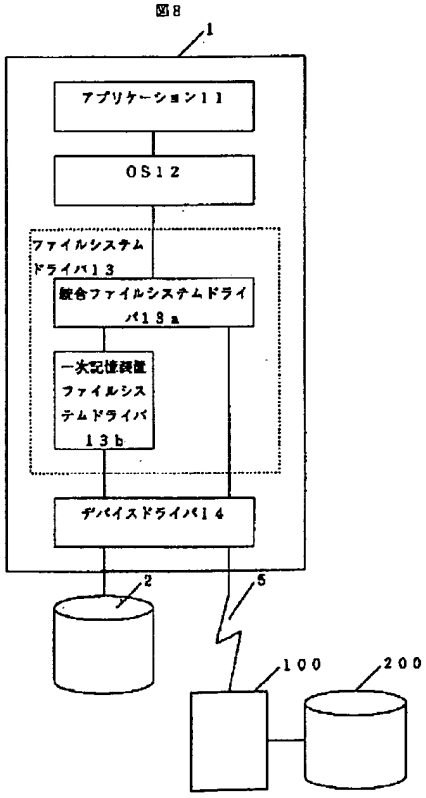
【図7】

図7



【図8】

図8



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